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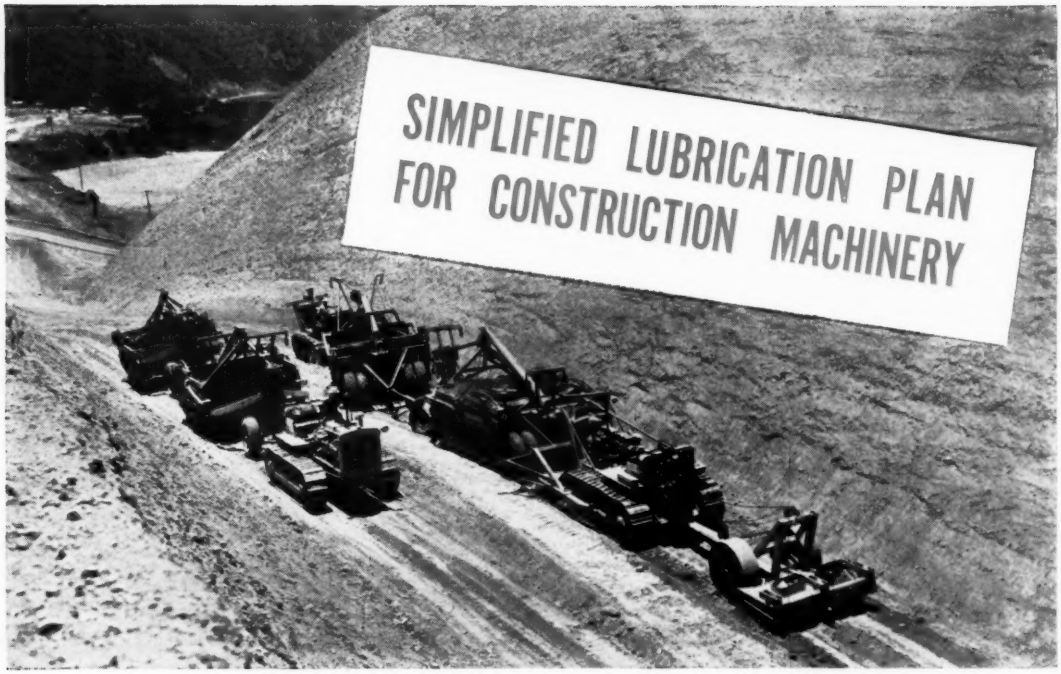
Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Construction
Machinery

PUBLISHED BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS



These eight quality lubricants are all you need*

Texaco Ursa Oil X★★
Texaco Meropa Lubricant
Texaco Ursa P-20 or Alcaid Oil
Texaco Marfak
Texaco Marfak Heavy Duty
Texaco Crater A
Texaco Crater X
Texaco Track Roll Lubricant

BEFORE the war contractors commonly used from 12 to 15 different lubricants to take care of the great variety of their equipment. The Texaco Simplified Lubrication Plan for construction machinery is based on the eight Texaco lubricants listed above. The development of multi-purpose lubricants, which is one of the recent advances in petroleum technology, has made possible this simplified lubrication plan.

The lubricants were selected with the cooperation of construction machinery manufacturers and are all that are normally required to maintain machinery and equipment in first class condition. The practicability of such a plan has been demonstrated in military operations.

Obviously, this reduction in the number of lubricants required offers contractors a considerable saving in maintenance costs — yet without sacrificing efficiency in any way.

For detailed recommendations on the operation of Texaco's Simplified Lubrication Plan, see inside back cover.

**Special Equipment may require one or more additional lubricants*

THE TEXAS COMPANY

LUBRICATION

A TECHNICAL PUBLICATION DEVOTED TO THE SELECTION AND USE OF LUBRICANTS

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Construction Machinery

THE construction industry has most successfully completed its war assignment and is swinging into a huge postwar program. This is an opportune time for the contractors, machinery builders and the oil companies to put into effect a much needed simplified lubrication program. This means standardizing on a few well selected general purpose lubricants.

The construction machinery manufacturers have already provided excellent lubrication charts, specifying the grades of lubricants which they consider most suitable for their equipment. These charts are extremely useful on a great many installations where the concentration of equipment is such that they can be accurately followed. Different manufacturers recommend different types or brands of lubricants. To meet the specialized recommendations shown on their charts for a variety of equipment, (such as rock drills, pumps, lighting sets, concrete mixers, scrapers, tractors, pavers and excavating machines, to mention a few), would require more lubricants than could be conveniently handled. For example, to meet the specialized lubrication recommendations for the above equipment on one small road contract would require five grades of motor oil, four grades of gear oil, three grades of gear and cable lubricant, six greases, a track roll lubricant, a cylinder oil and a hydraulic oil, altogether twenty-one different products.

Now, were you ever on a large construction project with sand being whipped up by a thirty mile wind and a completion date just around the corner? Under such conditions you do not give an oiler several different grease cans, several more different oil cans and a lubricant chart with circles and squares and blue and red lines and then say, "That unit has got to be back hauling dirt in ten minutes." The contractor's lubrication engineer knows from necessity that the twenty-one lubricants must be cut down to perhaps eight. The chief of the lubricating crew then has the problem of deciding which of the eight lubricants to apply where twenty-one are specified. This is putting responsibility where it does not belong. What the construction industry needs is a lubrication plan carefully worked out in advance so that it will not be necessary to improvise simplification methods in the field.

The purpose of this article is to present a plan for lubricating practically all construction machinery with eight lubricants. Advances in development and manufacturing of lubricants have made this possible. The eight main products are:

- SAE 30 Heavy Duty Engine Oil
- SAE 90 Gear Oil
- Light Mineral Oil
- General Purpose Grease
- Wheel Bearing Grease
- Track Roller Lubricant
- Open Gear Lubricant
- Cable Lubricant

It is hardly necessary to enumerate the advantages of having only one engine oil, one gear lubricant and one grease to apply. Economy, efficiency and orderliness will take the place of confusion in the handling of lubricants, all the way from the storehouse to final application. Better lubrication of moving parts will result. Theoretically, providing a multitude of special lubricants, each suitable for a particular part, should result in perfect lubrication. On a large construction project, due to the great variety of equipment, such a plan is unworkable. Confusion is the inevitable outcome of trying to handle a great number of special lubricants. And inevitably, the lubrication crew will arbitrarily select a few lubricants for all purposes. It is far better to provide this simplification in advance rather than

CHART I

SIMPLIFIED LUBRICATION PLAN FOR LARGE CONSTRUCTION PROJECTS

Part Requiring Lubrication	Hot Weather—Consistently Above 90° F.	Summer—Lowest Expected: Above 32° F.	Mild-Winter—Lowest Expected: Above 10° F.	Severe Cold—Lowest Expected: Below 10° F.
Gasoline and Diesel Engines	Heavy Duty Oil SAE 30	Heavy Duty Oil SAE 30	Heavy Duty Oil SAE 20	Heavy Duty Oil SAE 10
Gear Boxes Bearings (severe service) Chain Drives Flexible Couplings Universal Joints Other Oil Lubricated Parts in Heavy Duty Service	Gear Oil SAE 140	Gear Oil SAE 90	Gear Oil SAE 90	Gear Oil SAE 80
Hydraulic Mechanisms Air Cleaners Air Compressors Bearings (normal service) Electric Motors and Generators Other Oil Lubricated Parts in Light Duty Service	Straight Mineral Oil SAE 30	Straight Mineral Oil SAE 20	Straight Mineral Oil SAE 10	Straight Mineral Oil SAE 10
Wheel Bearings Hand Packed Ball and Roller Bearings	Wheel Bearing Grease No. 2	Wheel Bearing Grease No. 2	Wheel Bearing Grease No. 2	Wheel Bearing Grease No. 1
Track Rollers and other frequently lubricated bearings working in mud and water	Track Roller Lubricant—Heavy	Track Roller Lubricant—Medium	Track Roller Lubricant—Medium	Track Roller Lubricant—Light
Other grease fittings	General Purpose Grease #2	General Purpose Grease #1	General Purpose Grease #0	General Purpose Grease #0
Wire Rope and Cables	Cable Lubricant	Cable Lubricant	Cable Lubricant	Cable Lubricant
Open Gears	Open Gear Lubricant — Heavy	Open Gear Lubricant — Medium	Open Gear Lubricant — Light	Cable Lubricant

to try to work it out in the middle of a construction job, often a hundred miles from nowhere and after most of the oils and greases have been purchased.

If only one unit is involved, the number of lubricants is not so important. But on a large project, with a variety of equipment, if a large number of lubricants are supplied, there is a much greater chance of misapplication than if a few carefully selected lubricants are provided.

That a few lubricants will properly take care of all kinds of construction equipment was proven by the Army under the severest possible conditions. The simplified lubrication plan of the Army was carefully worked out in advance with the cooperation of the automotive, construction and oil industries. It was found for example, that at normal temperatures, most engines could be lubricated with an SAE 30 and most gears with an SAE 90 oil. This not only simplified things for the maintenance men and the drivers, but provided them with well-lubricated machines that functioned smoothly at any temperature, from the Artic Circle to the Tropics, in the sand of the desert as well as in amphibious operations in the Pacific.

In the simplified plan for commercial construction work the principal lubricants required and their main points of application, are listed in Chart I. This is the key to the simplified plan. Its utility is apparent; its simplicity obvious.

The adoption of a simplified lubrication plan does not mean that the present lubrication charts, which have been carefully prepared by the machinery builders, need be revised. Much of the construction machinery goes to operators who can follow the charts exactly and use lubricants specified. For the machine on a large project, however, general recommendations are needed such as:

	Frequency	
Part	*Hours*	*Lubricant*
Oil lubricated parts	8	SAE 20 Oil
Open grease fittings	8	General Purpose Grease
Capped grease fittings	48	General Purpose Grease
Engine crankcase	48	Heavy Duty Engine Oil SAE 30
Enclosed gears	960	Gear Oil SAE 90

This would be followed by a listing of points where special lubricants or instructions are needed. Such information would be for the experienced lubrication men on large projects where consolidation and simplification of lubricants is necessary.

A typical example, illustrating the application of the simplified plan, is shown in Chart II. There follows a description of the eight principal lubricants required, and a few explanatory remarks on oil and grease classification.

Heavy Duty Engine Oil

For gasoline and Diesel engines heavy duty oils have been developed. These are fortified with additives which impart detergent and extreme pressure characteristics and inhibit oxidation. This results in cleaner engines, adequate bearing protection and freedom from scuffing of pistons and cylinders.

It is recommended that the heavy duty oil be restricted to engine crankcases and a lighter, less expensive straight mineral oil be adopted for general use. For engine crankcases at normal temperatures, manufacturers generally recommend either SAE 20, 30 or 40 oils. Actual tests show little difference in engine performance on the three grades.

Gear Oil

Many of the different types of gears, such as the ordinary spur or spiral-bevel, where rolling contact occurs between the gear teeth, can be satisfactorily lubricated with a straight mineral oil. However, where there is a sliding contact between the gear teeth faces, as in hypoid or worm gears, the lubricants should be fortified to prevent scoring under heavy loads. These extreme pressure lubricants will also take care of slight misalignment or machining imperfections and are, therefore, frequently used for breaking in plain gears. Since a variety of

CHART II
MOTORIZED ROAD SCRAPER

Part	Hours Interval	Lubricant
Power Unit		
Crankcase	60	Heavy Duty Engine Oil
Air Cleaners	60	Light Mineral Oil
Generator	300	Light Mineral Oil
Cranking Motor	600	Light Mineral Oil
Water Pump	900	General Purpose Grease
Flywheel Clutch		
Release Bearing	300	General Purpose Grease
Pilot Bearing	300	Wheel Bearing Grease
Disengaging Yoke	10	General Purpose Grease
Control Levers and		
Drawbar Pins	10	General Purpose Grease
Main Case	400	Light Mineral Oil*
Transmission Case	600	Gear Oil
Power Control Unit		
Gear Case	900	Gear Oil
Brake Rollers and		
Control Linkage	60	Light Mineral Oil**
Sheave Bearings	10	General Purpose Grease
Cable Drum Bearings	3000	Wheel Bearing Grease
Brake Roller		
Shaft Bearings	3000	Wheel Bearing Grease
Cable	Do not lubricate	
Scraper		
Wheel Bearings	600	Wheel Bearing Grease
Tailgate Roller and		
Sheave Bearings	10	General Purpose Grease
Universal Forgings	10	General Purpose Grease
Ball and Socket Hitch	10	General Purpose Grease
Hinge Pins	10	General Purpose Grease
Spring Pipe	300	Gear Oil
Cables	60	Cable Lubricant

*Manufacturer recommends SAE 30 Engine Oil.
**Manufacturer recommends SAE 10 Engine Oil.

From Ewing Galloway, N. Y.

Chicamaugua Dam Construction — bulldozer and shodder

gears is found in construction machinery, to insure sufficient load carrying capacity for all types, extreme pressure gear oils are recommended. The additive used to impart this extra load carrying ability should not cause thickening, corrosion or sedimentation.

With the addition of an EP agent, there is no need for heavier grades to carry severe loads. It is merely necessary to provide a grade which will insure easy starting and at the same time not leak out.

Light Mineral Oil

The consumption of oil for general use, on a large construction project, is considerable. Hydraulic mechanisms and air cleaners especially, require a lot of oil. Since, for most general applications, an oil lighter than that used in the engine is preferred, it appears justified to use a light straight mineral oil wherever oil is required except in engines and gears.

General Purpose Grease

Greases are available which will withstand not only high temperatures but also the tendency to wash out, even in amphibious operations. By using such a grease, considerable simplification is achieved. With a general purpose grease it is not necessary to determine whether a particular grease fitting requires a chassis lubricant or a high temperature grease. The general purpose grease should be suitable for plain, ball and roller bearings.

Wheel Bearing Lubricant

A heavier grease is needed for wheel bearings and hand packed ball and roller bearings such as the clutch release and pilot bearings, which are subject to external heat.

Track Roller Lubricant

Track rollers and other parts of the Caterpillar type crawler mechanism require a lubricant which will be sufficiently fluid to flow through bearing passages and at the same time be sufficiently non-fluid to prevent leakage from worn bearings. This requires a special semi-fluid lubricant known generally as track roller lubricant, containing ingredients which impart stringiness to the lubricant.

Open Gear Lubricant

For open gears, and exposed sliding surfaces such as the dipper sticks of power shovels, a special lubricant should be used having exceptional adhesive and water resistance qualities. It should be heated to be sufficiently fluid to apply easily with a brush, or by pouring. Upon cooling, it should thicken sufficiently so that it will not drip or be thrown from the cable or gear teeth.

Cable Lubricant

A light adhesive lubricant which will penetrate, lubricating the individual strands and providing protection against rust.

Additional Lubricants

Special purpose lubricant will still be necessary for certain equipment such as:

Lubricant	*Use*
Water Pump Grease	Shaft sealed water pumps
Magneto Grease	Magnetos in hot locations
Car Journal Oil	Waste packed car journel
Steam Cylinder Oil	Steam engines
Form Oil	Concrete forms
Rust Proof Compound	Equipment in storage
Block Grease	Open bearings
Rock Drill Lubricant	Rock drills

Classification of Oils and Greases

Although oils and greases have many important qualities, from a practical standpoint their resistance to flow is of greatest interest. This is what is referred to when we speak of oils as being "light" or "heavy" and greases as "soft" or "hard". It is important because it controls consumption or leakage, friction or drag and ease of pumping or handling. Technically the fluidity of an oil is indicated by its "viscosity" and the consistency of a grease by its "penetration".

The S.A.E.* classification for automotive oils is by number, according to viscosity; i.e., Motor Oils Nos. 10, 20, 30, 40, 50, 60 or 70; Gear Oils Nos. 80, 90, 140 or 250. The higher the number in the same series, the more viscous the oil.

Until recently there was no standard grease numbering system; now however, greases are classified uniformly by penetration, as N.L.G.I.** Nos. 1, 2, 3, 4, 5 or 6; again, the higher the number the harder the grease.

For classification purposes the viscosity and penetration are taken at standard temperatures. Actually, however, when the temperature drops, oils become heavier or thicker and greases become harder or stiffer. It is necessary, therefore, to use lower numbered grades for low temperatures and higher numbered grades for high temperatures.

Chart No. III is a listing of construction machinery lubricants, showing their viscosity or penetration and the corresponding oil and grease classification.

"EARTH MOVERS"

To move the most dirt or complete any construction work with the least wear and tear of equipment requires not only putting the right lubricant in the right place but also exercising particular care in their application at certain points. Some of these "Earth Movers" are outlined below.

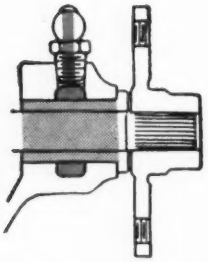
Anti-Freeze

Contamination of crankcase oil by anti-freeze solutions causes sludging. When adding anti-freeze

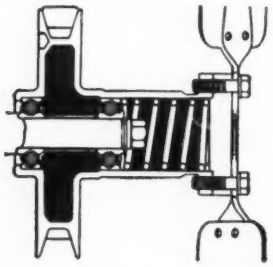
*Society of Automotive Engineers
**National Lubricating Grease Institute

Courtesy Gray Co., Inc.

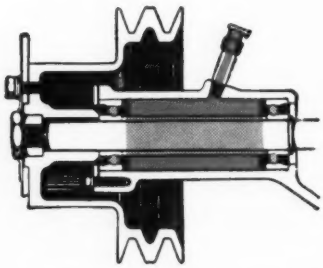
Portable Lubrication Unit



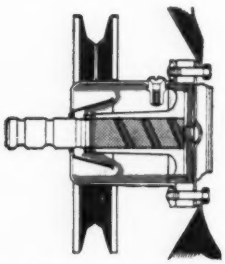
Plain bearing type fan. Lubricant is forced through fitting and into space between shaft and bearing.



Ball bearing type fan, using packed bearings.



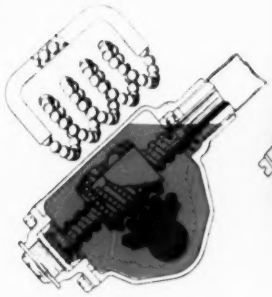
Ball bearing type fan, requiring regular lubrication.



Plain bearing fan of reservoir drain type.

Typical Fan Constructions.

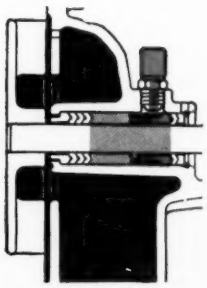
Worm and roller type steering gear with roller mounted on two ball bearings.



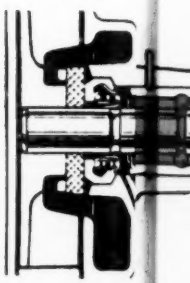
Steering gear with endless ball bearing train.

Steerings grs.

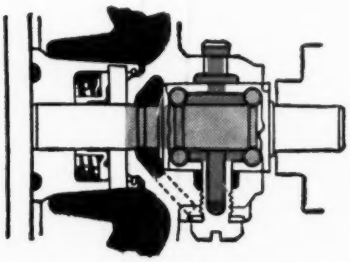
LUBRICATION IA



Grease lubricated water pump with covered fitting. Grease lubricates shaft and saturates packings.



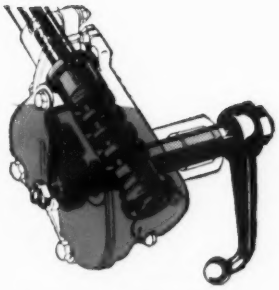
Ball bearing mou water shaft. Bearings lcated sembly; need no r lubric



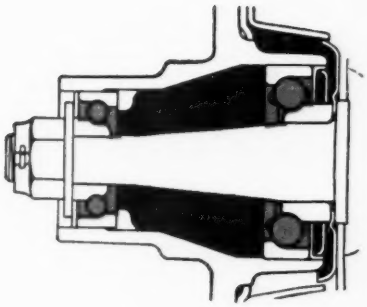
Water pump shaft on double ball bearings lubricated by a wick saturated with oil through cup.

Typical water mps.

...rm and sector type steering gear with modified worm for maximum contact.



Cam and lever type steering gear with two-point contact in normal position.

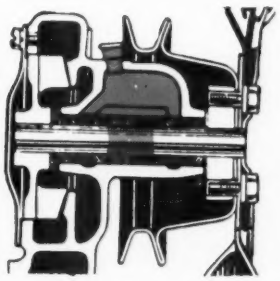


Front wheel bearings.

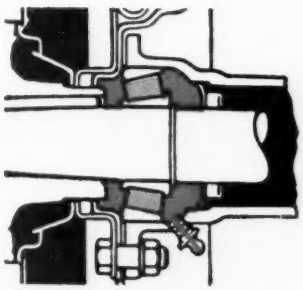
...gs grs,

...IAGRAMS

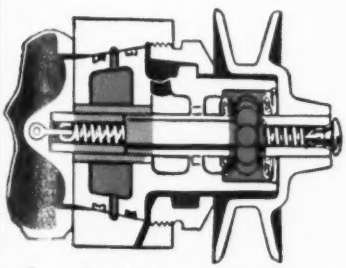
...nout water pump ...gs located at as... ...ne of lubrication.



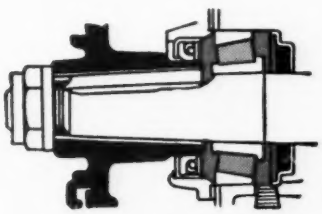
Water pump shaft carried in porous bronze bushing fed with very light oil from reservoir through cup.



Rear wheel bearings provided with fitting for lubrication of the bearings.



Pump bearing is porous bronze, oiled from timing gears. Fan bearing is ball type lubricated at assembly.



Rear wheel bearings requiring removal of wheel hub for lubrication.

Rear wheel bearings.

...ter...mps.

Courtesy of The Chek-Chart Corporation

make sure cylinder head, oil cooler and other hold-down bolts are tight and gaskets are in good condition.

Air Cleaners (Diagrams on p. 17)

Air cleaners may be of the wire gauze type in which the gauze is either replaced with a new element or washed in kerosine or Diesel fuel, dipped in oil and reused.

The oil bath-type cleaner requires inspection every 4 to 48 hours to keep the oil at the proper level and the oil cup clean. Every 1000 hours entire cleaner should be taken apart and cleaned.

Ball and Roller Bearings

Most ball and roller bearings have seals which prevent leakage of grease. If seals are in good condition, a grease charge should last upwards of 200 hours. Use low pressure gun and apply only a few shots unless bearing is vented. Forcing grease until showing around shaft will break seals. Fill between one quarter and one-half full.

Brakes

Wheel bearings should not be over-lubricated. Otherwise excess lubricant may reach brakes. Hydraulic brake mechanisms often contain rubber parts. Use only approved fluids.

Cables and Wire Ropes

Cables dragging in dirt should not be lubricated. Cables winding on drums equipped with clutches should be lubricated sparingly, to prevent the possibility of lubricant reaching clutch faces. Other cables should be cleaned every eight hours and cable lubricant applied with a brush. About every 500 hours, cable should be immersed in cable lubricant in a special trough built for this purpose.

Caterpillar Treads

Do not lubricate.

Chains

In order to lubricate pins of silent chains, the chains should be removed every fifty hours, washed in Diesel fuel or kerosine and soaked in hot gear oil.

Clutch

Do not over-lubricate clutch parts. Lubricant on clutch facings will cause slipping.

Distributors (Diagrams on p. 17)

The lower part of the distributor is often automatically lubricated from the engine. When driven from the generator, however, separate grease lubrication is usually required.

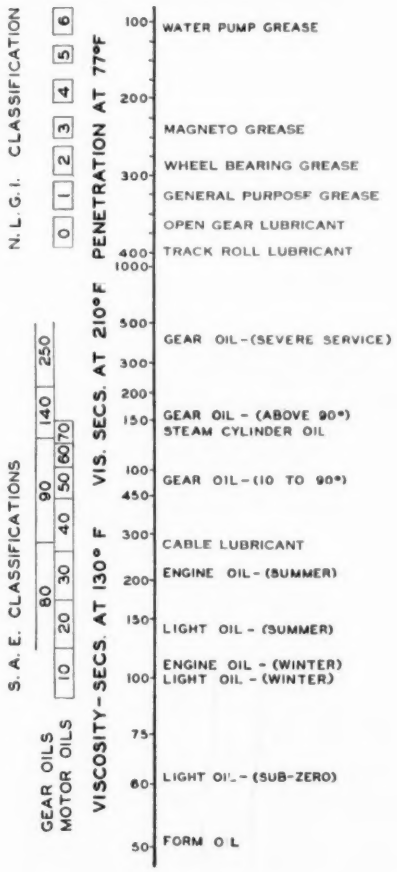
The upper distributor bearing may require either grease or oil lubrication.

The wick under the distributor cam requires lubrication with light oil.

An occasional touch of grease to the cam surfaces is desirable, making sure, however, that no lubricant reaches the breaker points.

CHART III

CONSTRUCTION MACHINERY LUBRICANTS
VISCOSITY OR PENETRATION
AND CLASSIFICATION



Engine Crankcase

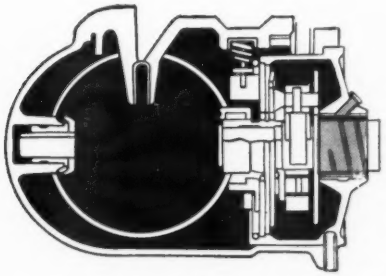
The drain period recommended by the engine manufacturer covers normal operation. Drain more frequently, if oil temperatures are above normal, if engine is started and stopped often, if engine is idled for long periods, if atmosphere is very dusty or if oil has been diluted to facilitate starting. Oil

draining or filter cleaning periods should be shortened, if filter or oil shows excessive contamination with dirt, metal, fuel, soot or sludge.

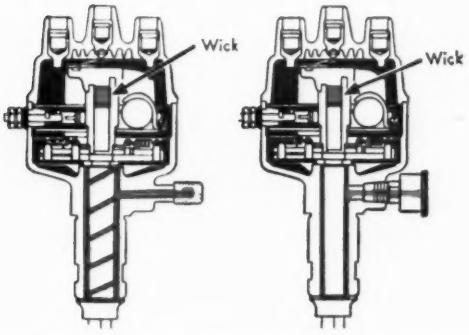
Drain oil while hot.

If oil filter is removed when draining oil, add an extra quantity when refilling crankcase.

Check oil level every eight hours after engine has been stopped for a few minutes to allow oil in upper part of engine to return to case.



Distributor with oil lubricated bearing at one end which is lubricated through oiler.



Distributor bearings of different types require lubrication with different kinds of lubricants. The wick under the rotor should not be overlooked.

Courtesy of The Chek-Chart Corporation

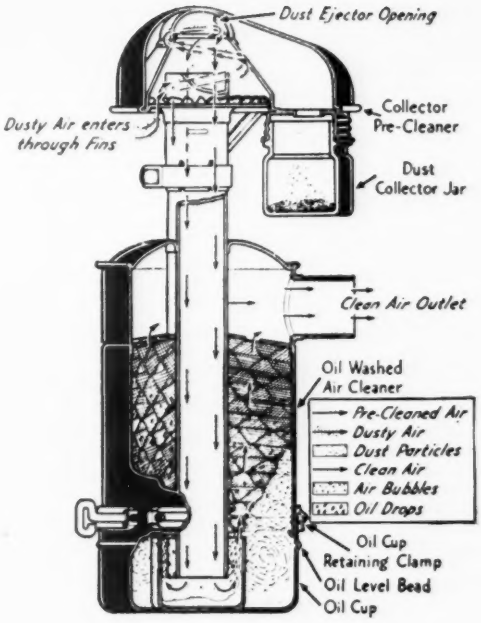
Fluid Drives

Use only approved fluids as directed.

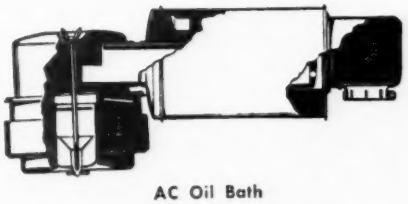
Fans (Diagrams on p. 14)

Fans, mounted on the extension of the shafts of other engine accessories and having no separate bearings, require no lubrication. Neither do those having permanently packed bearings.

Some fans require occasional grease application, while others must be regularly lubricated with oil. One type of oil lubricated fan is equipped with an overflow, another is provided with a stand pipe to insure the proper oil level In this latter type the reservoir is filled with oil and the excess drained by turning the fan until the filler hole is down.

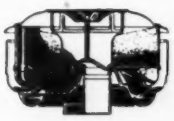


Oil washed



AC Oil Bath

Donaldson Oil Bath **Handy Oil Bath**



United Oil Bath

AC Wire Gauze

Types of air cleaners

Courtesy of The Chek-Chart Corporation

Gears — Enclosed

Check oil level in gear boxes every fifty hours. In most cases the oil need not be changed except at 1000 hour intervals. Keep oil seals in good condition to prevent leakage. Foaming or overheating in gear boxes usually indicates too high an oil level. Check drain plugs after heavy rain or severe dust conditions, drain and refill if water is present, or if dust is getting in.

Grease Fittings

Wipe fittings before and after applying grease. When plug has to be removed and fitting applied, it is an indication that that point should be lubricated only occasionally. Most parts such as plain bearings, should be lubricated frequently and freely. Add grease until clean grease shows at the point where the old grease is forced out.

From Ewing Galloway, N. Y.

Highway construction — power shovel, tractor and dump wagon

Gears — Open

Open gear lubricant should be heated so that it can be easily applied with a brush or poured while gears are turning slowly. The grade should be heavy enough so that dripping does not occur when the lubricant has cooled. Gears should be inspected every eight hours and more lubricant applied if necessary.

Gears operating in very dusty locations should be washed frequently with used crankcase oil and no other lubricant applied.

The lubricant for planetary and other gears located near clutches should be applied cold and sparingly.

Generators and Motors

Over-lubrication causes deterioration of windings and gum formation on commutator.

Grease Cups

Tighten until pressure is felt. Keep clean while filling.

Rubber Parts

Petroleum causes natural and some synthetic rubber to deteriorate. Keep tires, fan belt, rubber hose, rubber engine mountings, rubber bushings on radius rods and spring shackles and cooling system connections free from fuel, oil and grease.

Rustproofing

Before being placed in storage machinery should be thoroughly lubricated. Retouch any places where the paint has worn off. Unpainted exterior surfaces should be coated with Rustproof Compound.

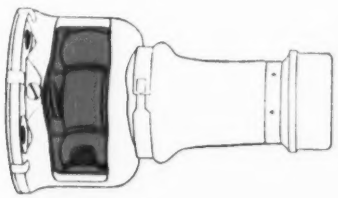
Specially treated engine preservative oils are available, while some of the heavy duty engine oils have excellent rustproofing characteristics. One of these should be used for engines, gear boxes, and other enclosed oiling systems and sealed before storage.

Shock Absorbers

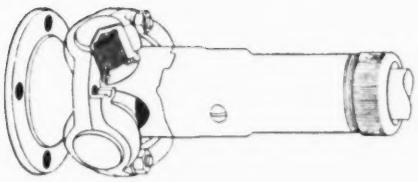
Often contain rubber. Use only approved fluids.

Springs

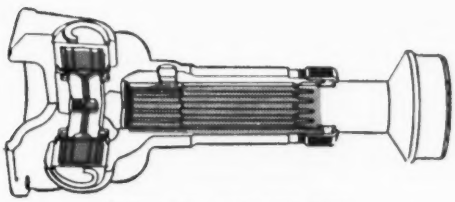
Lubricate spring leaves sparingly. Otherwise they may become overactive. Keep springs coated with grease to protect against rust. A graphite grease is recommended by most spring manufacturers.



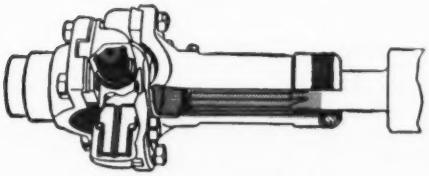
Roller type universal joint (Detroit with trunnion, no spline.



Roller type universal joint (Detroit) with lubricated spline.



Roller type universal joint (Spicer) with lubricated spline.

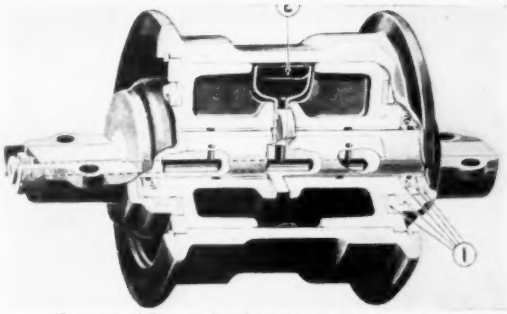


Roller type universal joint (Mechanics) with lubricated spline.

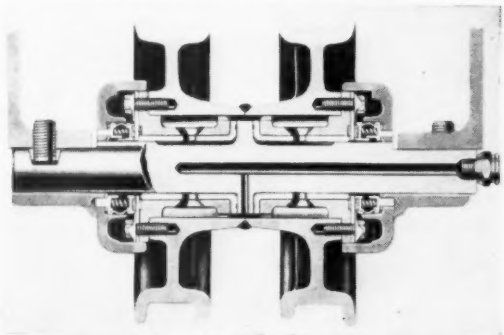
Types of universal joints.

Courtesy of The Chek-Chart Corporation

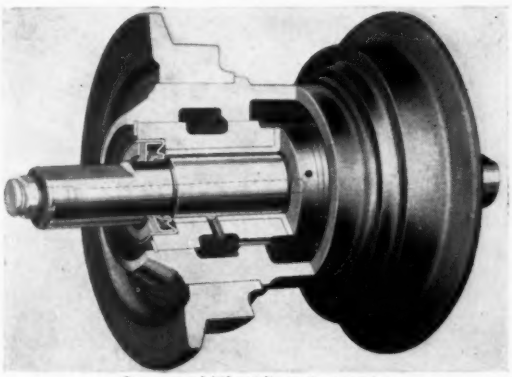
Coil springs on running gears, such as crawler tension springs, in alternating freezing and thawing weather should be packed with grease to keep freezing mud from hindering spring action.



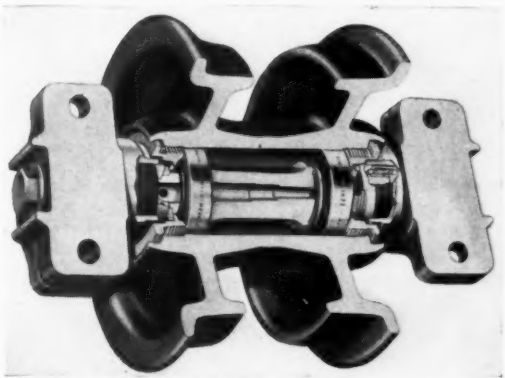
Courtesy of International Harvester Company, Inc.



Courtesy of Caterpillar Tractor Co.



Courtesy of The Oliver Corporation



Courtesy of Allis-Chalmers Manufacturing Company

Typical Track Roll Details

From Ewing Galloway, N. Y.

Grand Coulee Dam — concrete mixing plant and placing trestles

Steering Gear (Diagrams on p. 14, 15)

The steering gear housing should be kept filled with gear oil, not only to lubricate the gear surfaces, but the bearings and steering shaft. A low pressure dispensing pump should be used to prevent lubricant being forced up the steering column.

Track Rollers (Diagrams on p. 19)

Track rollers of crawler mechanism require frequent lubrication to prevent dirt and water from working in. Those on shovels, draglines, cranes, etc., should be lubricated every hour when traveling.

Universal Joints (Diagrams on p. 19)

Some universal joints are provided with a fitting for lubrication. The ball and trunion type should not be over-lubricated, otherwise the boot will become filled with lubricant. Some roller bearing types require disassembly and hand packing by an experienced mechanic.

The propeller shaft splines, in most cases, are equipped with a fitting. The type of plug or fitting should not be changed. Otherwise the balance of this rotating part will be affected.

Water Pump (Diagrams on p. 14, 15)

Some water pumps require no lubrication, being lubricated either automatically from the engine or permanently packed at the factory.

Some water pumps have a wick leading from an oil sump and others have porous bushings through which the oil seeps to the bearings.

Those grease lubricated water pumps in which the grease does not come in contact with the engine coolant, (i.e., when the grease is applied to an external support bearing) should be lubricated with general purpose grease.

Those grease lubricated water pumps in which the grease does come in contact wtih the engine coolant, (i.e., when the grease is used to lubricate the packing seal) should be lubricated with a stiff, waterproof grease.

Wheel Bearings (Diagrams on p. 15)

Front wheel bearings are usually lubricated by removing the hubs and repacking by hand.

Rear wheel bearings may require removal. Others are automatcially lubricated from the differential or are permanently packed at the factory. Some are equipped with a grease cup or fitting. Still others are equipped with a plug which must be removed and a fitting substituted, the plug being replaced after lubrication.

Whenever wheel bearings are removed for lubrication, the bearings should be examined and washed carefully. Grease is then packed around the bearings, after which they are replaced. Grease seals should be carefully examined and replaced if necessary. Ball bearings must be adjusted so that the wheel will turn freely with no end play. Only a small amount of additional grease should be placed in the bearing housing as over-lubrication may result in grease getting on brakes.

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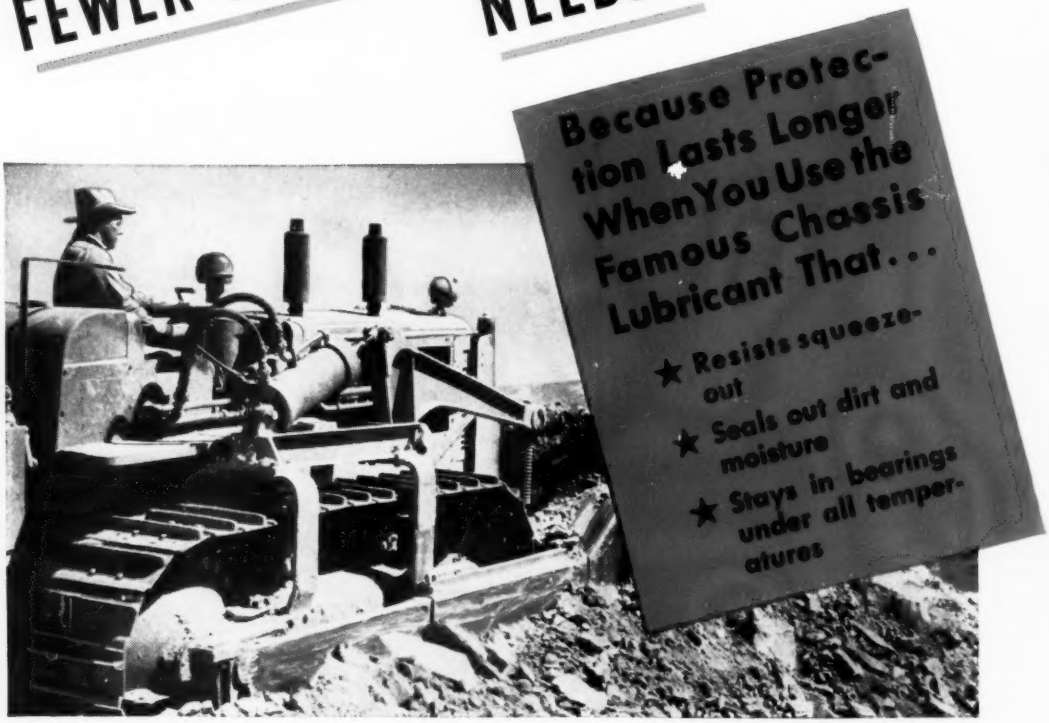
TEXACO SIMPLIFIED LUBRICATION PLAN FOR LARGE CONSTRUCTION PROJECTS

Texaco Lubricants Recommended For Indicated Temperatures

Part Requiring Lubrication	Consistently Above 90° F.	Lowest Expected Above 32° F.	Lowest Expected Above 10° F.	Lowest Expected Below 10° F.
Gasoline and Diesel Engines	Texaco Ursa Oil X-30★★	Texaco Ursa Oil X-30★★	Texaco Ursa Oil X-20★★	Texaco Ursa Oil X-10★★
Gear Boxes Bearings (severe service) Chain Drives Flexible Couplings Universal Joints Other oil lubricated parts in heavy duty service	Texaco Meropa Lubricant—6	Texaco Meropa Lubricant—3	Texaco Meropa Lubricant—3	Texaco Meropa Lubricant—1
Hydraulic Mechanisms Air Cleaners Air Compressors Bearings (normal service) Electric Motors and Generators Other oil lubricated parts in light duty service	Texaco Ursa Oil P-30 or Algol Oil	Texaco Ursa Oil P-20 or Alcaid Oil	Texaco Ursa Oil P-10 or Cetus Oil	Texaco Spica Oil
Wheel Bearings Hand Packed Ball and Roller Bearings	Texaco Marfak No. 2 H.D.	Texaco Marfak No. 2 H.D.	Texaco Marfak No. 2 H.D.	Texaco Regal Starfak No. 1
Track Rollers and other frequently lubricated bearings working in mud and water	Texaco Track Roll Lubricant Heavy	Texaco Track Roll Lubricant Medium	Texaco Track Roll Lubricant Medium	Texaco Track Roll Lubricant Light
Other Grease Fittings	Texaco Marfak No. 3	Texaco Marfak No. 1	Texaco Marfak No. 0	Texaco Regal Starfak No. 1
Cables	Texaco Crater A	Texaco Crater A	Texaco Crater A	Texaco Crater A
Open Gears	Texaco Crater No. 5X	Texaco Crater No. 2X	Texaco Crater No. 1X	Texaco Crater A

FEWER APPLICATIONS NEEDED—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★ Resists squeeze-out
★ Seals out dirt and moisture
★ Stays in bearings under all temperatures

TRACTORS, graders, shovels, trucks and other construction equipment last longer, maintenance costs go down, when you lubricate them with long-lasting *Texaco Marfak*.

Marfak — a unique product, designed especially for chassis lubrication—is both tough and adhesive. It cushions parts against road shocks and clings tenaciously to bearing surfaces despite high speeds, heavy loads and extremes of temperature. Its high resistance to squeeze-out means greater protection with fewer applications.

For wheel bearings, the right lubricant to use is *Texaco Marfak Heavy Duty*. It stays *in* the bearings, assuring safer braking. No seasonal change is required.

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